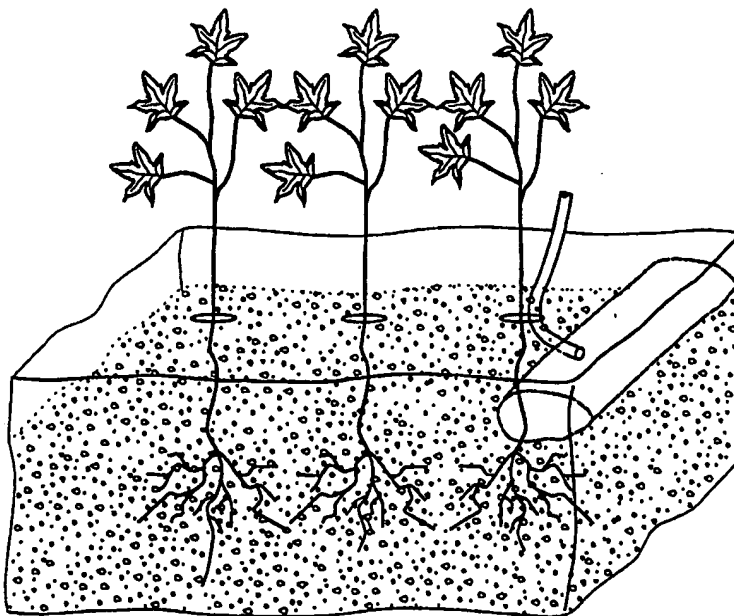




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : C02F 1/44, B01D 61/36, A01G 9/24, 27/04, F24F 6/02, A23L 1/00, A61K 9/00	A3	(11) International Publication Number: WO 99/40031 (43) International Publication Date: 12 August 1999 (12.08.99)
<p>(21) International Application Number: PCT/US99/02291</p> <p>(22) International Filing Date: 4 February 1999 (04.02.99)</p> <p>(30) Priority Data: 09/019,287 5 February 1998 (05.02.98) US</p> <p>(71) Applicants: E.I. DU PONT DE NEMOURS AND COMPANY [US/US]; 1007 Market Street, Wilmington, DE 19898 (US). DESIGN TECHNOLOGY & INNOVATION LIMITED [GB/GB]; Suffolk House, George Street, Croydon CR0 0YN (GB).</p> <p>(72) Inventors: TONKIN, Mark, Christopher; The Barn, Ripe Lane, Ripe Village, Lewes, Sussex BN8 6AP (GB). YOUNG, Mark, Andrew; 32 Sunnyhill Road, Hemel Hempstead, Hertfordshire HP1 1SZ (GB). KIRCHNER, Olaf, Norbert; 1200 Presidential Drive, Wilmington, DE 19807 (US).</p> <p>(74) Agent: PHAM, Hanh, T.; E.I. du Pont de Nemours and Company, Legal Patent Records Center, 1007 Market Street, Wilmington, DE 19898 (US).</p>		<p>(81) Designated States: AL, AU, BA, BB, BG, BR, CA, CN, CU, CZ, EE, GD, GE, HR, HU, ID, IL, IN, IS, JP, KP, KR, LC, LK, LR, LT, LV, MG, MK, MN, MX, NO, NZ, PL, RO, SG, SI, SK, SL, TR, TT, UA, UZ, VN, YU, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p>Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p> <p>(88) Date of publication of the international search report: 11 November 1999 (11.11.99)</p>

(54) Title: WATER PURIFICATION APPARATUS



(57) Abstract

The present invention relates to the use of a hydrophilic membrane to provide by the process of vaporation through the membrane water suitable for agricultural irrigation, industrial use, hydrating or rehydrating of food or agricultural or pharmaceutical compositions. The present invention also relates to a water purification apparatus which includes the hydrophilic membrane, comprising one or more layers of hydrophilic polymers, to purify water which may contain suspended or dissolved impurities and solids, including but not limited to seawater, brackish water and other kinds of polluted water.

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 99/02291

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 C02F1/44 B01D61/36 A01G9/24 A01G27/04 F24F6/02
A23L1/00 A61K9/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 C02F B01D A01G F24F A23L A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>US 5 595 662 A (SANDERSON) 21 January 1997 (1997-01-21)</p> <p>column 1, line 59 - column 2, line 27 column 3, line 47 - line 49 tables</p> <p>---</p> <p>-/--</p>	<p>1, 2, 4, 6, 7, 9-11, 17-19, 21, 25, 27, 28, 31, 32, 35, 36, 39, 43, 45, 47-49, 57</p>

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

8 September 1999

Date of mailing of the international search report

17.09.99

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3018

Authorized officer

Ruppert, G

INTERNATIONAL SEARCH REPORT

Int. Application No.

PCT/US 99/02291

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KORNGOLD ET AL: "Water desalination by pervaporation with hollow fiber membranes" DESALINATION, vol. 107, no. 2, 1 October 1996 (1996-10-01), page 121-129 XP004071159 the whole document ----	1,2,11, 17,18, 21,25, 27,31, 32,35, 36,39, 43, 47-49,57
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A	US 4 978 505 A (KERTZ) 18 December 1990 (1990-12-18) column 9, line 29 - line 31 column 17, line 25 - line 27 ----	56
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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 99/02291

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3 415 719 A (TELKES) 10 December 1968 (1968-12-10) column 5, line 45 - line 56; claim 1; figure 3 ---	30
A	US 4 725 481 A (OSTAPCHENKO) 16 February 1988 (1988-02-16) cited in the application -----	

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 99/02291

Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☒ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International Application No. PCT/US 99/02291

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1,6,7,9,10,11,17,21,31,
and claims dependent thereupon

Apparatus comprising a hydrophilic membrane for separating pollutants from water, processes and use of a hydrophilic membrane for water purification

2. Claims: 12,15,29,30 and claims dependent thereupon

Process for increasing the moisture content in a dehydrated matter using a water delivery system with a hydrophilic membrane, method for hydrating at least one of a foodstuff and a drug using a container comprising a hydrophilic membrane and article comprising at least a foodstuff and a drug contained within a container, wherein at least part of the article is comprised of a hydrophilic membrane

3. Claims: 13,55,56

Process for germinating plant seeds and growing a seedling and method for controlling the moisture content in a growing medium comprising a hydrophilic membrane and article comprising at least a seed and a seedling contained within a container comprising a hydrophilic membrane

4. Claim : 16

Process for controlling the humidity of an airspace in an enclosed chamber comprising a water delivery system with a hydrophilic membrane

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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INTERNATIONAL SEARCH REPORT

Information on patent family members

In .ational Application No

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